144004

IGT Project Number: 40800-01

COMPARATIVE ANALYSIS OF SEDIMENT SAMPLES FROM THE CHEQUAMEGON BAY NEAR THE KREHER PARK SHORELINE, ASHLAND WISCONSIN

ADDENDUM TO THE REPORT:
COMPARATIVE ANALYSIS OF NAPL RESIDUES FROM THE NSP ASHLAND FORMER MGP SITE AND THE ASHLAND LAKEFRONT PROPERTY (KREHER PARK)

Prepared by

INSTITUTE OF GAS TECHNOLOGY
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For

NORTHERN STATES POWER COMPANY
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May, 2000

EXECUTIVE SUMMARY

The Institute of Gas Technology (IGT) has conducted laboratory analysis of two sediment samples retrieved from the Chequamegon Bay near the Kreher Park shoreline in Ashland, Wisconsin. Samples were tested using identical methods described in the report, *Comparative Analysis Of NAPL Residues From The NSP Ashland Former MGP Site And The Ashland Lakefront Property (Kreher Park)* (NAPL Report), and evaluated against results of that report. This document serves as an Addendum to the NAPL Report, prepared in March, 2000.

Using GC/FID fingerprinting techniques, results concluded that sediment material from AS-2 and AS-4 are very similar in tar composition, and are very similar to the tar contained in the NAPL sample from MW-7, previously described in the NAPL Report. The tar from sediment samples AS-2 and AS-4 is dissimilar to tar found in NAPL samples from wells MW-15 and EW-1.

Samples AS-2 and AS-4 each possess a middle weight petroleum (oil) fraction, ranging 6.8 to 16 percent aliphatic hydrocarbon. The percentages of oil fraction in AS-2 and AS-4 are not similar to any NAPL samples described in the NAPL Report.

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INTRODUCTION

Northern States Power Company (NSP) has contracted the Institute of Gas Technology (IGT) to determine whether sediment samples retrieved from the Chequamegon Bay near the Kreher Park shoreline in Ashland, Wisconsin are chemically similar or dissimilar to NAPL residues found in wells located at the NSP former MGP site (MW-15 and EW-1) and in an area of former wood treatment operations in Kreher Park (MW-7). The results of the sediment analysis serve as an Addendum to the report, *Comparative Analysis of NAPL Residues From The NSP Ashland Former MGP Site And The Ashland Lakefront Property (Kreher Park)* (NAPL Report).

IGT and its subcontractor (META Environmental, Inc.) have completed forensic analysis of two sediment samples. Analyses of these samples have included identification and/or quantification of: 1) monocyclic hydrocarbons (MAHs), 2) polycyclic aromatic hydrocarbons (PAHs), and, 3) aliphatic hydrocarbons and polar hydrocarbons. Analyses and hydrocarbon fingerprinting were performed using gas chromatography with flame ionization detection (GC/FID). These analyses are described in detail in the NAPL Report. The purpose of these tests was to determine chemical similarity or dissimilarity between the samples and between previously described characterization of NAPL samples from wells MW-15, MW-7 and EW-1 (NAPL Report). Results of all sediment analyses are included in this Addendum Report, with expanded analytical data detailed in Appendix B of this Addendum Report.

SITE BACKGROUND

Historically, Chequamegon Bay has been utilized as a vital transportation route for the shipment of various materials to and from the town of Ashland, Wisconsin, including iron ore, lumber, pulp and coal. During the 19th century, Ashland was one of the busiest ports on the Great Lakes (1).

Sanborn Fire Insurance Maps of the vicinity indicate that the jetty currently used by the Ellis Avenue Marina was constructed prior to 1895, and was initially used as a loading dock and to support a rail spur. Two large docks or jetties separated by a slip were constructed prior to 1901 in the vicinity of the present Prentice Avenue Boat Ramp. The shoreline between Ellis Avenue and Prentice Avenue was filled to its approximate present configuration by 1901. A log boom historically extended offshore in the proximity of the present wastewater treatment plant structure. The historic configuration of the sediment investigation area shoreline remained largely unchanged between 1901 and 1951 (2)

In recent times, the shipping industry through the bay has declined because of the decline in the mining and lumber industries in the region. (1)

Sampling and analysis of bay sediments is detailed in the Short Elliot Hendrickson Inc. (SEH) Report, *Sediment Investigation Report, Chequamegon Bay- Ashland, Wisconsin*, July, 1996 (Bay Sediment Report). The reported purpose of the Bay Sediment Report was to, "identify the degree and extent of offshore sediment contamination adjacent to the Ashland Lakefront Property."

METHODS

The results of the analyses are included in this Addendum report, with expanded analytical data detailed in Appendix A of this Addendum report. Sediment samples were collected from Chequamegon Bay near the Kreher Park shoreline in Ashland, Wisconsin on February 8, 2000. These samples were collected by SEH on behalf of the Wisconsin Department of Natural Resources (WDNR). This work was completed to further characterize sediment contamination previously identified and delineated by SEH on behalf of the WDNR. A Dames & Moore representative was on-site to observe sample collection procedures and to collect representative samples for finger printing analysis in accordance with the Dames & Moore January 25, 2000 Work Plan. Details of the Chequamegon Bay sampling event are included in a letter to IGT from Dames & Moore (see Appendix B).

Samples AS-2 and AS-4 were placed in 4-ounce glass jar, filled to the top with zero headspace, and screw-cap tops served as seals. The samples were packed in ice and sent overnight with the completed chain-of-custody forms to the laboratory (META Environmental, Inc., Watertown, MO) for immediate analysis. The results of laboratory testing were sent to IGT for interpretation.

Analyses of the samples included: 1) gas chromatography with flame ionization detection (GC/FID), and, 2) simulated distillation. A chromatographic fingerprint was obtained from each sample using GC/FID, identifying and/or quantifying each of the compound classes: 1) monocyclic hydrocarbons (MAHs), 2) polycyclic aromatic hydrocarbons (PAHs), and, 3) aliphatic hydrocarbons and polar hydrocarbons.

RESULTS

The GC/FID fingerprint data from the two sediment samples (AS-2 and AS-4) shows that the aromatic fraction (tar) of both samples is very similar to the aromatic component in the NAPL sample from well MW-7, located near the former wood treatment operations in Kreher Park (refer to NAPL Report). Particular observations drawn from the results are as follows:

- The GC/FID fingerprints of the whole extracts of the sediment samples AS-2 and AS-4 are very similar, exhibiting a tar-like pattern.

- The GC/FID fingerprints of the aromatic fractions (tar) of the sediment samples AS-2 and AS-4 are distinctly different from the aromatic fractions in NAPL samples from wells MW-15 and EW-1 (on or below the Ashland NSP former MGP property).

- The GC/FID fingerprinting of the tar fraction of sediment samples AS-2 and AS-4 are highly similar to the tar component of the NAPL sample from well MW-7, in Kreher Park.

- When compared with standard samples of known origin, the tar fraction of the sediment samples from AS-2 and AS-4 do not exhibit the characteristics of a carburetted water gas tar.

- The percentage of total aliphatic hydrocarbons (middle petroleum distillates) and total aromatic hydrocarbons (tar fraction) is different between sediment samples AS-2 and AS-4.

  - Results from the simulated distillation of the sediment sample AS-2 indicates that the percentage of middle petroleum distillates is lower than all previously tested NAPL samples, from wells MW-7, MW-15 and EW-1. The aliphatic hydrocarbon composition of the sediment sample AS-2 was only 6.8 percent of total (with 87 percent aromatic fraction).

  - Results from the simulated distillation of the sediment sample AS-4 indicates that the percentage of aliphatic hydrocarbons (middle petroleum distillates) is higher than all NAPL samples from wells MW-15 and EW-1, but lower than the NAPL sample from well MW-7. The aliphatic hydrocarbon composition of the sediment sample AS-4 was 16 percent of total (with 79 percent aromatic fraction).

The actual GC/FID scans or fingerprints for each sample are shown in Appendix B of the Addendum report.

DISCUSSION OF RESULTS

Results of all testing indicated the following:

1) The aromatic components (tar) in sediment samples from the Chequamegon Bay (AS-2 and AS-4) are nearly identical. This is consistent with the fact that both samples were retrieved from the contained Bay area, adjacent to Kreher Park and near the shoreline.

2) The aromatic components (tar) from samples from the Chequamegon Bay (AS-2 and AS-4) are highly similar to the tar component in the NAPL sample from well MW-7. This result is consistent with the fact the Chequamegon Bay is directly adjacent to Kreher Park and was affected by operations that occurred in Kreher Park.

3) The tar component in sediment samples AS-2 and AS-4 is substantially dissimilar to the tar component in NAPL from wells MW-15 and EW-1. Compared with known standards, the tar component in AS-2 and AS-4 is not identified as carburetted water gas tar.

CONCLUSIONS

Results of testing and analysis of samples retrieved from the Chequamegon Bay in Ashland, Wisconsin (AS-2 and AS-4) are revealing. The tar contamination present in the sediment material from the Bay is highly similar in composition to the tar found in the NAPL material from Kreher Park (MW-7 sample). Based upon previous analysis and comparison of the well MW-7 NAPL sample against known standards, it is clear that the sediment samples are not carburetted water gas tars. Tars associated with sediment samples AS-2 and AS-4, as well as the NAPL sample MW-7, appear to be derived from the same source. This result is highly consistent with the fact that the Chequamegon Bay is directly adjacent to Kreher Park and was most likely affected by operations on this property.

Testing and analysis of the sediment samples retrieved from the Bay also indicate that the tar is from a separate source from NAPL samples retrieved from wells MW-15 and EW-1. The tar component in the well samples from MW-15 and EW-1 is dissimilar to the tar component in sediment samples AS-2 and AS-4. Compared with known standards, sediment samples AS-2 and AS-4 are not identified as carburetted water gas tars.

Laboratory analysis of the aliphatic (oil fraction) and aromatic (tar) fractions of the sediment samples AS-2 and AS-4 reveal that the samples are dissimilar to each other and to samples retrieved from wells MW-15, MW-7 and EW-1, in terms of percent fractions. The differences in percent fraction of oil versus tar in each sample may be due to effects of the environment on the sample, condition of the sample upon deposit in the sampling area, or other explanations not elucidated through this laboratory work.

It is highly unlikely that weathering of the sample affected the overall percent quantity of oil fraction present in the sediment samples. In fact, laboratory analysis indicates that the oil fractions of the sediment samples AS-2 and AS-4 are not weathered. However and without regard to the quantity of oil fraction, it is important to note that the tar (aromatic) component in the samples is highly similar to tar contained in the NAPL sample from MW-7 and is most likely from the same source.

Based on the results of analyses performed and in comparison with reference standards, IGT concludes that the tar component in the sediment samples from the Chequamegon Bay and the tar component in the NAPL material from well MW-7 are highly similar and from the same source. The tar contained in the sediment samples is substantially dissimilar to the carburetted water gas tar component in the NAPL samples from wells on the NSP Ashland Property, MW-15 and EW-1. As concluded in the NAPL Report, the NAPL material from well MW-7 is consistent with wood treatment activities reportedly conducted at Kreher Park.

REFERENCES

1) *Supplemental Facility Site Investigation and Remedial Action Options Evaluation Report.* Dames & Moore. March 1, 1999.

2) *Sediment Investigation Report, Chequamegon Bay – Ashland, Wisconsin.* SEH, July, 1996.

APPENDIX A

META Environmental, Inc.

49 Clarendon S
Watertown, MA
TEL: (617) 923-46
FAX: (617) 923-4

March 6, 2000

Dr. Diane Saber
Institute of Gas Technology
1700 S. Mt. Prospect Road
Des Plains, IL 60018

RE: Report: Environmental Forensic Analysis of 2 Sediment Samples

Dear Dr. Saber:

META Environmental, Inc. (META) has completed the analysis of two sediment samples, AS-2 and AS-4, for environmental forensic parameters. Those parameters included monocyclic aromatic hydrocarbons (MAHs), polycyclic aromatic hydrocarbons (PAHs), hydrocarbon fingerprint by gas chromatography with flame ionization detection (GC/FID), total aliphatic hydrocarbons, and total polar hydrocarbons.

The results for MAHs, PAHs, hydrocarbon fingerprint, total aliphatic and total polar hydrocarbon fractions are provided in this report.

Method

The samples were extracted using draft EPA Method 3570. A portion of each extract was spiked with surrogate compounds (2,5-dibromotoluene, 2-bromonaphthalene, and 1-chlorooctadecane) and then fractionated into aliphatic, aromatic, and polar fractions using silica gel column chromatography according to EPA Method 3630C. Each fraction was concentrated to a known final volume, spiked with internal standards, and analyzed by GC/FID.

The following is an example of the sample identification codes for the fractions:

IG000211-01UF	whole extract
IG000211-01PF	aliphatic fraction (in pentane)
IG000211-01DF	aromatic fraction (in methylene chloride, DCM)
IG000211-01MF	polar fraction (in methanol)

Results

The GC/FID fingerprints for the whole extracts, aliphatic, aromatic, and polar fractions

are included in this report.

GC/FID fingerprints of the whole extracts of samples AS-2 and AS-4 are very similar, exhibiting a pyrogenic, or tar-like pattern. As expected, the GC/FID fingerprints of the aromatic fractions were essentially the same as those of the whole extracts. The GC/FID fingerprints of the aliphatic fractions were very similar, resembling a middle weight petroleum distillate. Finally, neither polar fraction contained detectable levels of tar acids (phenol and alkylated phenols).

Finally, the concentrations of total extractable hydrocarbons, total aliphatic hydrocarbons, and total aromatic hydrocarbons were determined, and are reported in Table 1. The compositions of samples AS-2 and AS-4 were 6.8 to 16 percent aliphatic and 79 to 87 percent aromatic hydrocarbons.

Table 1
Aliphatic and Aromatic Hydrocarbons in NAPL Samples

Sample	TEH (mg/kg)*	Aliphatic (mg/kg)*	Aromatic (mg/kg)*	% Aliphatic	% Aromatic
AS-2	16,400	1,110	13,000	6.8	79
AS-4	11,400	1,850	9,880	16	87

TEH - total extractable hydrocarbons
* concentrations have been corrected for surrogate recoveries

If you have any questions regarding these data, please call me.

Sincerely,

David M. Mauro
V. President

DRAFT

Privileged and Confidential
Prepared Under the Direction of Counsel

Privileged and Confidential
Prepared in Anticipation of Litigation

META

ANALYTICAL RESULTS
MAHs, PAHs, and Hydrocarbons
Client: IGT Project: Forensic Study

Field ID	AS-2			
Lab ID	IG000211-01UF	IG000211-01PF	IG000211-01DF	IG000211-01MF
Fraction	Total	Aliphatic	Aromatic	Polar
MAHs:				
Benzene	3.24	0.19 U	0.80	0.38 U
Toluene	19.2	0.19 U	3.61	0.38 U
Ethylbenzene	85.5	0.19 U	22.4	0.38 U
m/p-Xylene	55.4	0.19 U	15.0	0.38 U
Styrene	0.19 U	0.19 U	0.68	0.38 U
o-Xylene	30.0	0.19 U	9.78	I
1,2,4-Trimethylbenzene	58.3	0.19 U	27.3	I
Total MAHs:	193	ND	62.3	ND
PAHs:				
Naphthalene	1,150 D	I	891 D	0.28 J
2-Methylnaphthalene	750 D	I	607 D	0.38 U
1-Methylnaphthalene	377 D	I	322 D	0.38 U
Acenaphthylene	23.5	I	16.9	I
Acenaphthene	372 D	I	341 D	I
Dibenzofuran	35.6	I	31.9	0.38 U
Fluorene	199	I	203	0.38 U
Phenanthrene	402 D	I	383 D	1.31
Anthracene	207	I	186	I
Fluoranthene	194	I	166	I
Pyrene	296	I	268	0.38 U
Benz(a)anthracene	52.2	I	58.1	I
Chrysene	66.6	I	62.2	0.38 U
Benzo(b)fluoranthene	41.0	I	29.4	I
Benzo(k)fluoranthene	31.1	I	34.4	0.38 U
Benzo(a)pyrene	67.5	0.19 U	58.4	0.38 U
Indeno(1,2,3-cd)pyrene	24.5	0.19 U	22.3	0.38 U
Dibenz(a,h)anthracene	5.12	0.19 U	5.46	0.38 U
Benzo(g,h,i)perylene	29.8	0.19 U	27.0	0.38 U
Total PAHs:	4,290	ND	3,680	1.68
Quantitation Limit:	0.19	0.19	0.38	0.38
Detection Limit:	0.08	0.08	0.15	0.15
Fluorobenzene (SS1)	56%	23%	3%	1%
2-Fluorobiphenyl (SS2)	93%	12%	85%	0%
Total Hydrocarbons	12,600	1,120	8,670	618
Concentration Units:	mg/kg	mg/kg	mg/kg	mg/kg

B = Analyte detected in the blank
D = Values from a diluted sample extract
DL = QC compounds diluted out
E = Estimated value, above calibration range
I = Interference
J = Estimated value
L = Coeluted with compound listed above
NM = Not measured
U = Not detected at quantitation limit shown
Total MAHs does not include 1,2,4-Trimethylbenzene.
Total PAHs does not include Dibenzofuran.
All soil results reported on a dry weight basis.

META

ANALYTICAL RESULTS
MAHs, PAHs, and Hydrocarbons
Client: IGT Project: Forensic Study

Field ID	AS-4			
Lab ID	IG000211-02UF	IG000211-02PF	IG000211-02DF	IG000211-02MF
Fraction	Total	Aliphatic	Aromatic	Polar
MAHs:				
Benzene	0.54	0.17 U	0.60	0.33 U
Toluene	4.39	I	1.32	0.33 U
Ethylbenzene	33.0	I	9.77	0.33 U
m/p-Xylene	30.9	I	8.11	0.33 U
Styrene	0.25	I	0.80	0.33 U
o-Xylene	17.6	I	5.82	I
1,2,4-Trimethylbenzene	43.0	I	20.4	I
Total MAHs:	86.6	ND	26.4	ND
PAHs:				
Naphthalene	443 D	I	337 D	0.26 J
2-Methylnaphthalene	426 D	I	340 D	I
1-Methylnaphthalene	285 D	I	241 D	I
Acenaphthylene	26.2	I	20.4	I
Acenaphthene	170	I	281	I
Dibenzofuran	58.7	I	57.2	I
Fluorene	131	I	129	I
Phenanthrene	250 D	I	241 D	0.71
Anthracene	106	I	103	I
Fluoranthene	108	I	111	I
Pyrene	152	I	147	I
Benz(a)anthracene	42.0	I	46.6	I
Chrysene	44.8	I	46.6	I
Benzo(b)fluoranthene	25.2	I	20.2	I
Benzo(k)fluoranthene	26.3	I	30.2	I
Benzo(a)pyrene	45.0	0.17 U	41.1	I
Indeno(1,2,3-cd)pyrene	16.2	0.17 U	16.9	I
Dibenz(a,h)anthracene	4.36	0.17 U	5.02	I
Benzo(g,h,i)perylene	16.5	0.17 U	19.2	0.33 U
Total PAHs:	2,320	ND	2,180	0.97
Quantitation Limit:	0.17	0.17	0.33	0.33
Detection Limit:	0.07	0.07	0.13	0.13
Fluorobenzene (SS1)	61%	23%	4%	1%
2-Fluorobiphenyl (SS2)	92%	8%	86%	0%
Total Hydrocarbons	10,500	1,740	7,280	826
Concentration Units:	mg/kg	mg/kg	mg/kg	mg/kg

B = Analyte detected in the blank
D = Values from a diluted sample extract
DL = QC compounds diluted out
E = Estimated value, above calibration range
I = Interference
J = Estimated value
L = Coeluted with compound listed above
NM = Not measured
U = Not detected at quantitation limit shown
Total MAHs does not include 1,2,4-Trimethylbenzene.
Total PAHs does not include Dibenzofuran.
All soil results reported on a dry weight basis.

META

ANALYTICAL RESULTS
MAHs, PAHs, and Hydrocarbons
Client: IGT Project: Forensic Study

Field ID	Soil Blank			
Lab ID	IG000216-SBUF	IG000216-SBPF	IG000216-SBOF	IG000216-SBMF
Fraction	Total	Aliphatic	Aromatic	Polar
MAHs:				
Benzene	0.13	0.13 U	0.28	0.13 U
Toluene	0.12 J	0.13 U	0.65	0.13 U
Ethylbenzene	0.13 U	0.13 U	1.09	0.13 U
m/p-Xylene	0.13 U	0.13 U	0.06 J	0.13 U
Styrene	0.13 U	0.13 U	0.13 U	0.13 U
o-Xylene	0.13 U	0.13 U	0.74	0.13 U
1,2,4-Trimethylbenzene	0.13 U	0.13 U	0.13 U	0.13 U
Total MAHs:	0.25	ND	2.81	ND
PAHs:				
Naphthalene	0.13 U	0.13 U	0.05 J	0.13 U
2-Methylnaphthalene	0.13 U	0.13 U	0.13 U	0.13 U
1-Methylnaphthalene	0.13 U	0.13 U	0.13 U	0.13 U
Acenaphthylene	0.13 U	0.13 U	0.13 U	0.13 U
Acenaphthene	0.13 U	0.13 U	0.13 U	0.13 U
Dibenzofuran	0.13 U	0.13 U	0.13 U	0.13 U
Fluorene	0.13 U	0.13 U	0.13 U	0.13 U
Phenanthrene	0.13 U	0.13 U	0.13 U	0.13 U
Anthracene	0.13 U	0.13 U	0.13 U	0.13 U
Fluoranthene	0.13 U	0.13 U	0.13 U	0.13 U
Pyrene	0.13 U	0.13 U	0.13 U	0.13 U
Benz(a)anthracene	0.13 U	0.13 U	0.13 U	0.13 U
Chrysene	0.13 U	0.13 U	0.13 U	0.13 U
Benzo(b)fluoranthene	0.13 U	0.13 U	0.13 U	0.13 U
Benzo(k)fluoranthene	0.13 U	0.13 U	0.13 U	0.13 U
Benzo(a)pyrene	0.13 U	0.13 U	0.13 U	0.13 U
Indeno(1,2,3-cd)pyrene	0.13 U	0.13 U	0.13 U	0.13 U
Dibenz(a,h)anthracene	0.13 U	0.13 U	0.13 U	0.13 U
Benzo(g,h,i)perylene	0.13 U	0.13 U	0.13 U	0.13 U
Total PAHs:	ND	ND	0.05	ND
Quantitation Limit:	0.13	0.13	0.13	0.13
Detection Limit:	0.05	0.05	0.05	0.05
Fluorobenzene (SS1)	63%	0%	10%	0%
2-Fluorobiphenyl (SS2)	78%	0%	64%	0%
Total Hydrocarbons	< 100	< 100	< 100	< 100
Concentration Units:	mg/kg	mg/kg	mg/kg	mg/kg

B = Analyte detected in the blank
D = Values from a diluted sample extract
DL = QC compounds diluted out
E = Estimated value, above calibration range
I = Interference
J = Estimated value
L = Coeluted with compound listed above
NM = Not measured
U = Not detected at quantitation limit shown
Total MAHs does not include 1,2,4-Trimethylbenzene.
Total PAHs does not include Dibenzofuran.
All soil results reported on a dry weight basis.

META

ANALYTICAL RESULTS
MAHs, PAHs, and Hydrocarbons
Client: IGT Project: Forensic Study

Field ID	Soil Blank Spike			
Lab ID	IG000216-SBSUF	IG000216-SBSPF	IG000216-SBSDF	IG000216-SBSMF
Fraction	Total	Aliphatic	Aromatic	Polar
MAHs:				
Benzene	61%	0%	7%	0%
Toluene	84%	0%	40%	0%
Ethylbenzene	87%	0%	57%	0%
m/p-Xylene	87%	0%	54%	0%
Styrene	88%	0%	54%	0%
o-Xylene	88%	0%	59%	0%
1,2,4-Trimethylbenzene	88%	0%	59%	0%
Total MAHs:				
PAHs:				
Naphthalene	86%	0%	61%	0%
2-Methylnaphthalene	85%	0%	64%	0%
1-Methylnaphthalene	85%	0%	64%	0%
Acenaphthylene	85%	0%	64%	0%
Acenaphthene	86%	0%	71%	0%
Dibenzofuran	86%	0%	75%	0%
Fluorene	87%	0%	80%	0%
Phenanthrene	88%	0%	89%	0%
Anthracene	84%	0%	84%	0%
Fluoranthene	87%	0%	93%	0%
Pyrene	88%	0%	93%	0%
Benz(a)anthracene	88%	0%	91%	1%
Chrysene	88%	0%	94%	0%
Benzo(b)fluoranthene	89%	0%	95%	0%
Benzo(k)fluoranthene	87%	0%	94%	0%
Benzo(a)pyrene	88%	0%	86%	0%
Indeno(1,2,3-cd)pyrene	88%	0%	93%	0%
Dibenz(a,h)anthracene	89%	0%	92%	0%
Benzo(g,h,i)perylene	90%	0%	93%	0%
Total PAHs:				
Quantitation Limit:				
Detection Limit:				
Fluorobenzene (SS1)	62%	0%	7%	0%
2-Fluorobiphenyl (SS2)	83%	0%	66%	0%
Total Hydrocarbons				
Concentration Units:	% Recovery	% Recovery	% Recovery	% Recovery

B = Analyte detected in the blank
D = Values from a diluted sample extract
DL = QC compounds diluted out
E = Estimated value, above calibration range
I = Interference
J = Estimated value
L = Coeluted with compound listed above
NM = Not measured
U = Not detected at quantitation limit shown
Total MAHs does not include 1,2,4-Trimethylbenzene.
Total PAHs does not include Dibenzofuran.
All soil results reported on a dry weight basis.

META

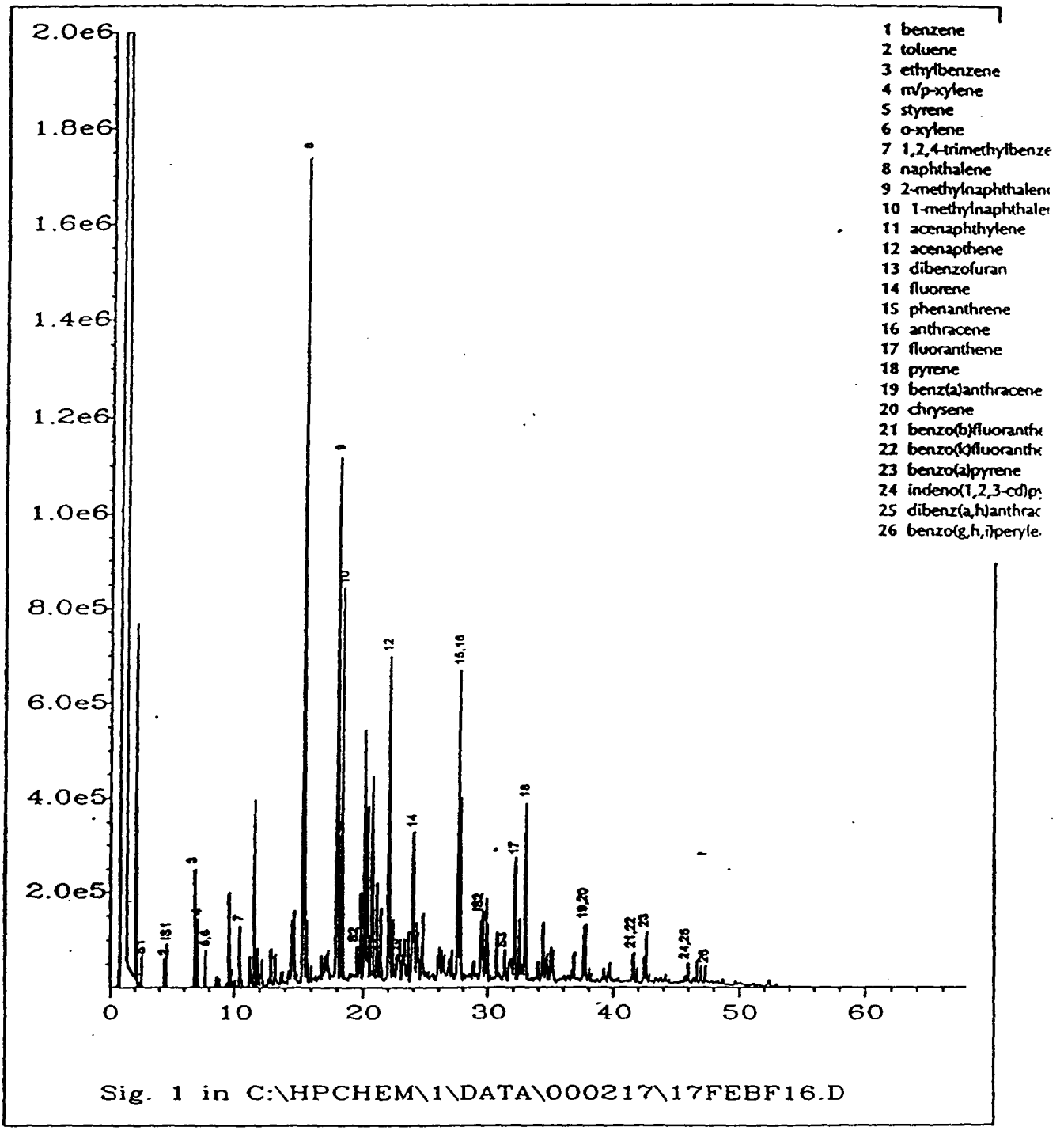
ANALYTICAL RESULTS
MAHs, PAHs, and Hydrocarbons
Client: IGT Project: Forensic Study

Field ID	AS-2 Duplicate			
Lab ID	IG000211-01DUPUF	IG000211-01DUPPF	IG000211-01DUPDF	IG000211-01DUPMF
Fraction	Total	Aliphatic	Aromatic	Polar
MAHs:				
Benzene	16%		-20%	
Toluene	13%		-9%	
Ethylbenzene	16%		-2%	
m/p-Xylene	17%		3%	
Styrene				
o-Xylene	18%		-1%	
1,2,4-Trimethylbenzene	17%		8%	
Total MAHs:	16%		0%	
PAHs:				
Naphthalene	13%		7%	-16%
2-Methylnaphthalene	13%		6%	
1-Methylnaphthalene	12%		5%	
Acenaphthylene	15%		6%	
Acenaphthene	12%		4%	
Dibenzofuran	14%		-16%	
Fluorene	2%		6%	
Phenanthrene	12%		4%	-20%
Anthracene	17%		12%	
Fluoranthene	13%		7%	
Pyrene	14%		7%	
Benz(a)anthracene	7%		5%	
Chrysene	13%		6%	
Benzo(b)fluoranthene	35%		17%	
Benzo(k)fluoranthene	-11%		-2%	
Benzo(a)pyrene	14%		8%	
Indeno(1,2,3-cd)pyrene	14%		8%	
Dibenz(a,h)anthracene	11%		6%	
Benzo(g,h,i)perylene	14%		8%	
Total PAHs:	12%		6%	-19%
Quantitation Limit:				
Detection Limit:				
Fluorobenzene (SS1)	10%	-21%	-14%	
2-Fluorobiphenyl (SS2)	1%	14%	-4%	-35%
Total Hydrocarbons	12%	-81%	4%	-19%
Statistic	RPD	RPD	RPD	RPD

B = Analyte detected in the blank
D = Values from a diluted sample extract
DL = QC compounds diluted out
E = Estimated value, above calibration range
I = Interference
J = Estimated value
L = Coeluted with compound listed above
NM = Not measured
U = Not detected at quantitation limit shown
Total MAHs does not include 1,2,4-Trimethylbenzene.
Total PAHs does not include Dibenzofuran.
All soil results reported on a dry weight basis.

META

GC/FID Fingerprint

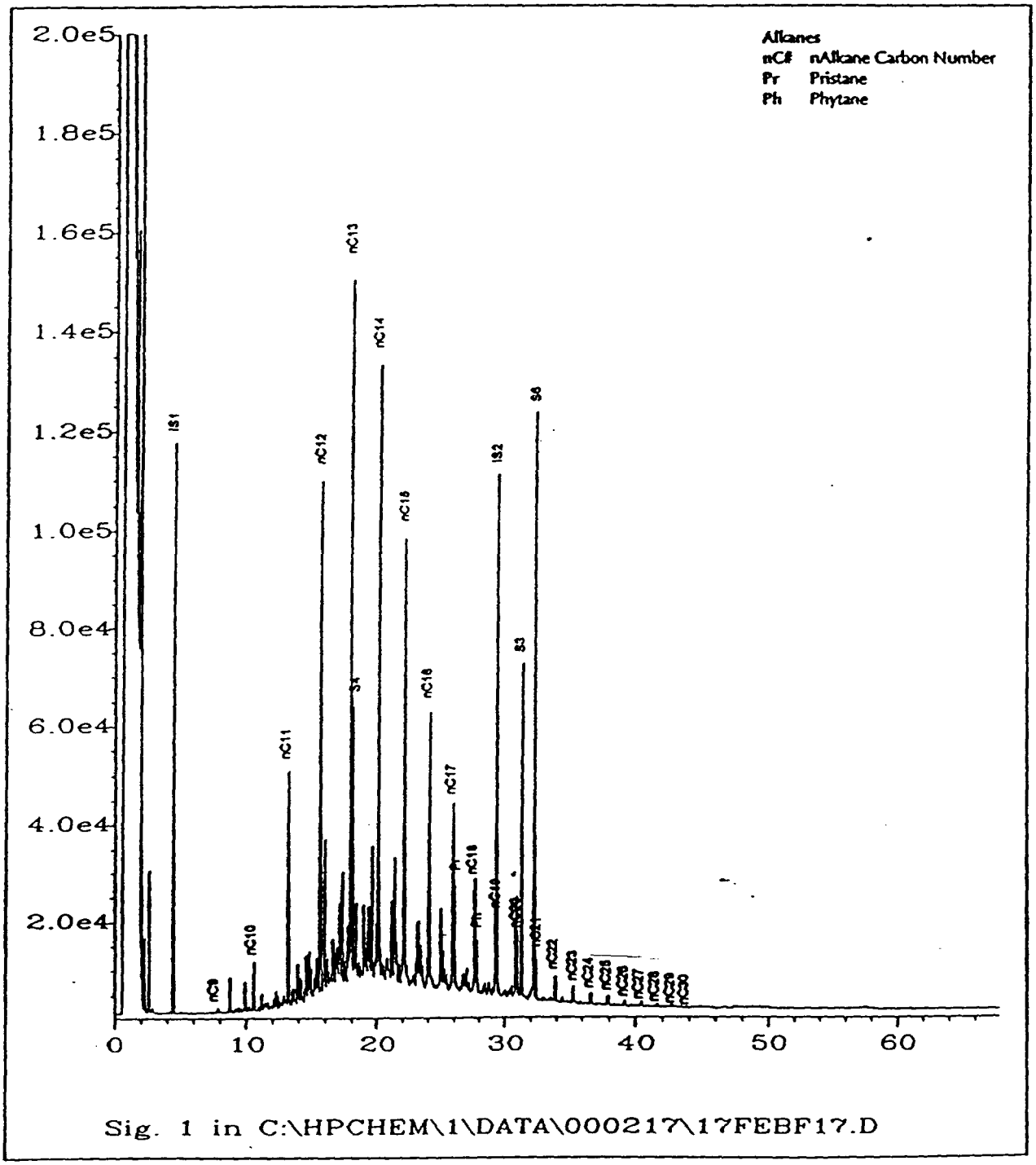


IS1 - 2,4-difluorotoluene
IS2 - o-terphenyl
S1 - fluorobenzene
S2 - 2-fluorobiphenyl
S3 - 5a-androstane
S4-2,5-dibromotoluene
S5-2-bromonaphthalene
S6-1-chlorooctadecane

Field ID:	AS-2
Laboratory ID:	IG000211-01UF
Method:	MET4007D

META

GC/FID Fingerprint

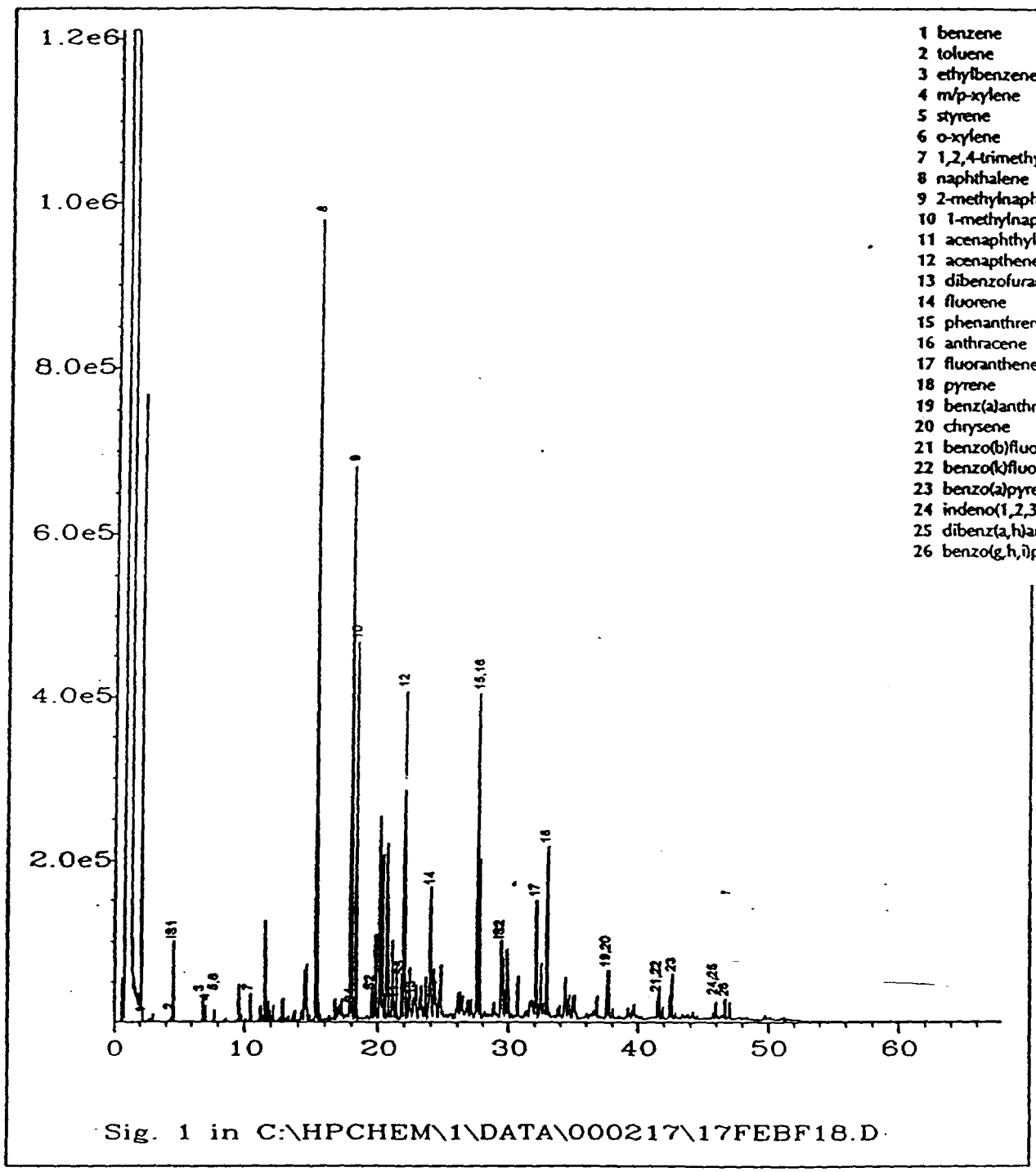


IS1 - 2,4-difluorotoluene
IS2 - o-terphenyl
S1 - fluorobenzene
S2 - 2-fluorobiphenyl
S3 - 5a-androstane
S4-2,5-dibromotoluene
S5-2-bromonaphthalene
S6-1-chlorooctadecane

Field ID:	**AS-2**
Laboratory ID:	IG000211-01PF
Method:	MET4007D

META

GC/FID Fingerprint



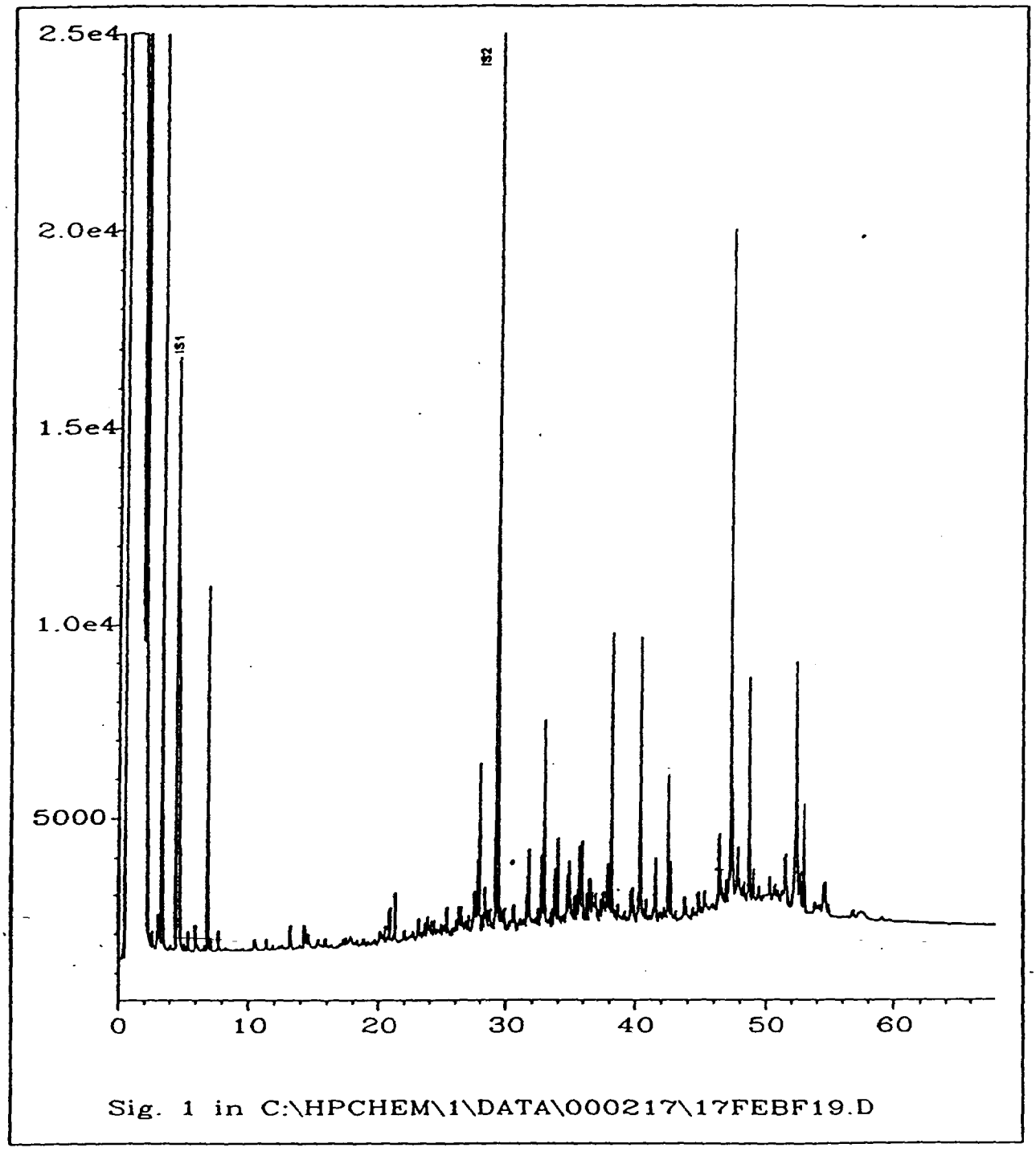
Sig. 1 in C:\HPCHEM\1\DATA\000217\17FEBF18.D

IS1 - 2,4-difluorotoluene
IS2 - o-terphenyl
S1 - fluorobenzene
S2 - 2-fluorobiphenyl
S3 - 5a-androstane
S4-2,5-dibromotoluene
S5-2-bromonaphthalene
S6-1-chlorooctadecane

Field ID:	AS-2
Laboratory ID:	IG000211-01DF
Method:	MET4007D

META

GC/FID Fingerprint

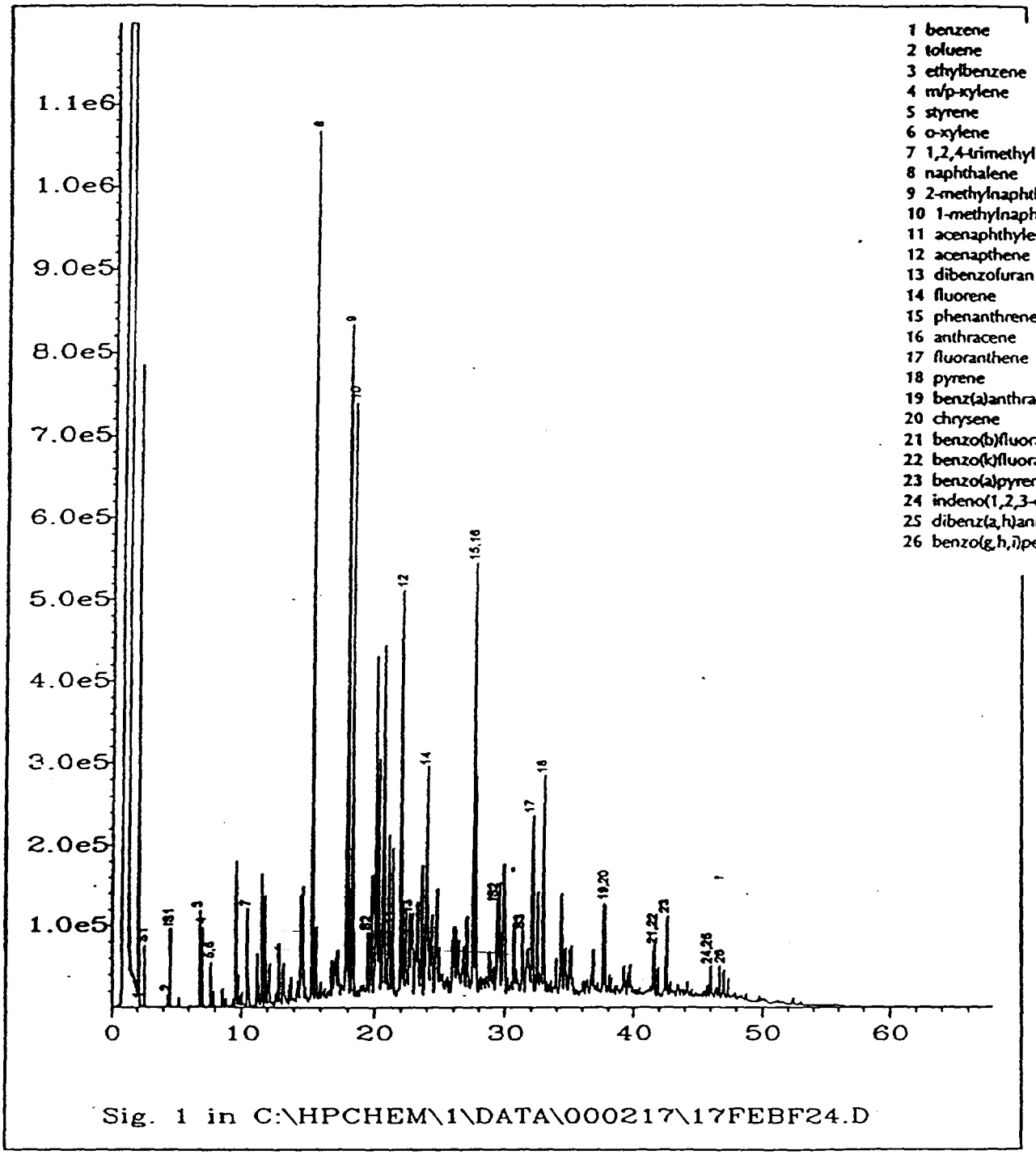


IS1 - 2,4-difluorotoluene
IS2 - o-terphenyl
S1 - fluorobenzene
S2 - 2-fluorobiphenyl
S3 - 5a-androstane
S4-2,5-dibromotoluene
S5-2-bromonaphthalene
S6-1-chlorooctadecane

Field ID:	AS-2
Laboratory ID:	IG000211-01MF
Method:	MET4007D

META

GC/FID Fingerprint

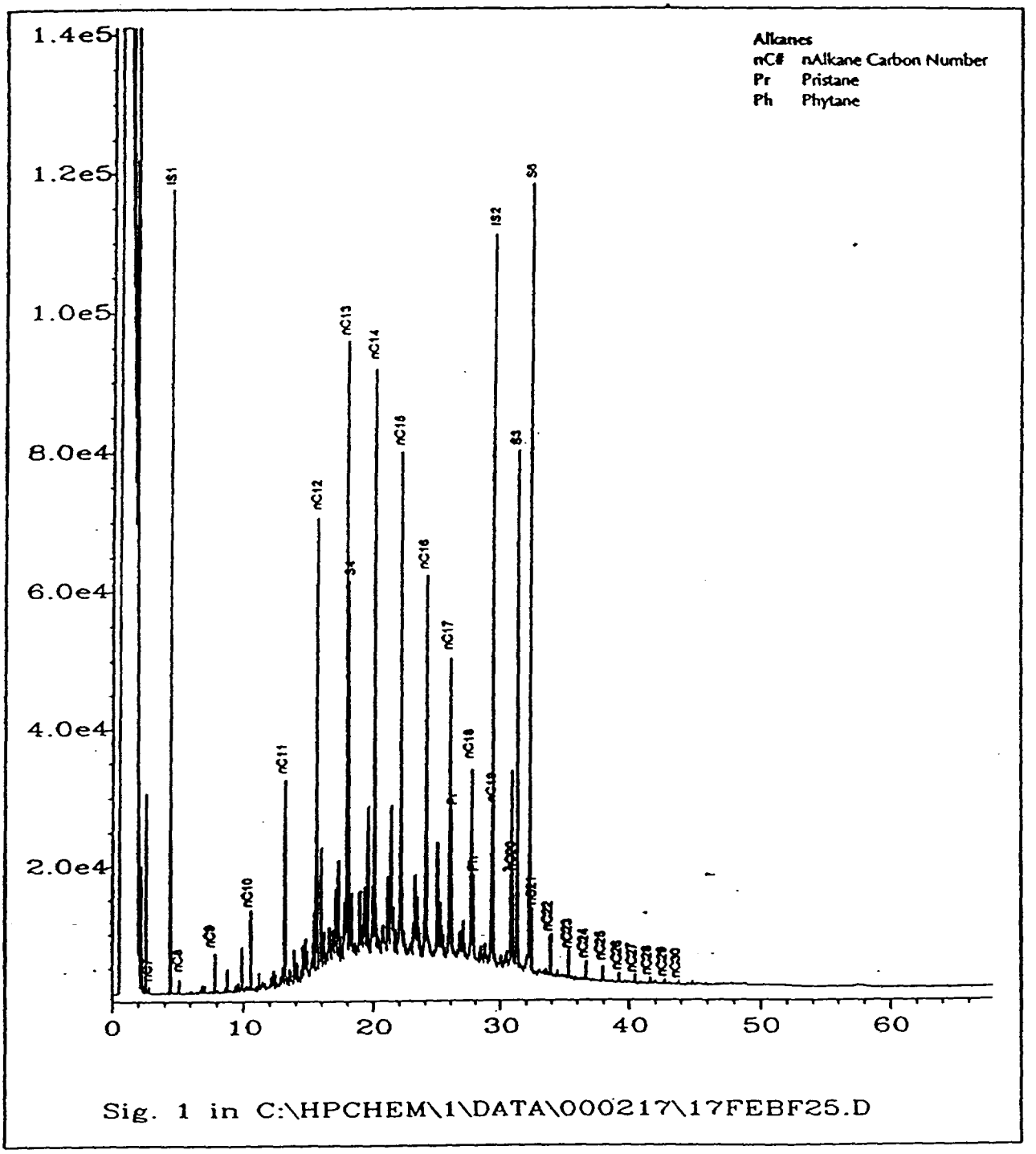


IS1 - 2,4-difluorotoluene
IS2 - o-terphenyl
S1 - fluorobenzene
S2 - 2-fluorobiphenyl
S3 - 5a-androstane
S4-2,5-dibromotoluene
S5-2-bromonaphthalene
S6-1-chlorooctadecane

Field ID:	AS-4
Laboratory ID:	IG000211-02UF
Method:	MET4007D

META

GC/FID Fingerprint

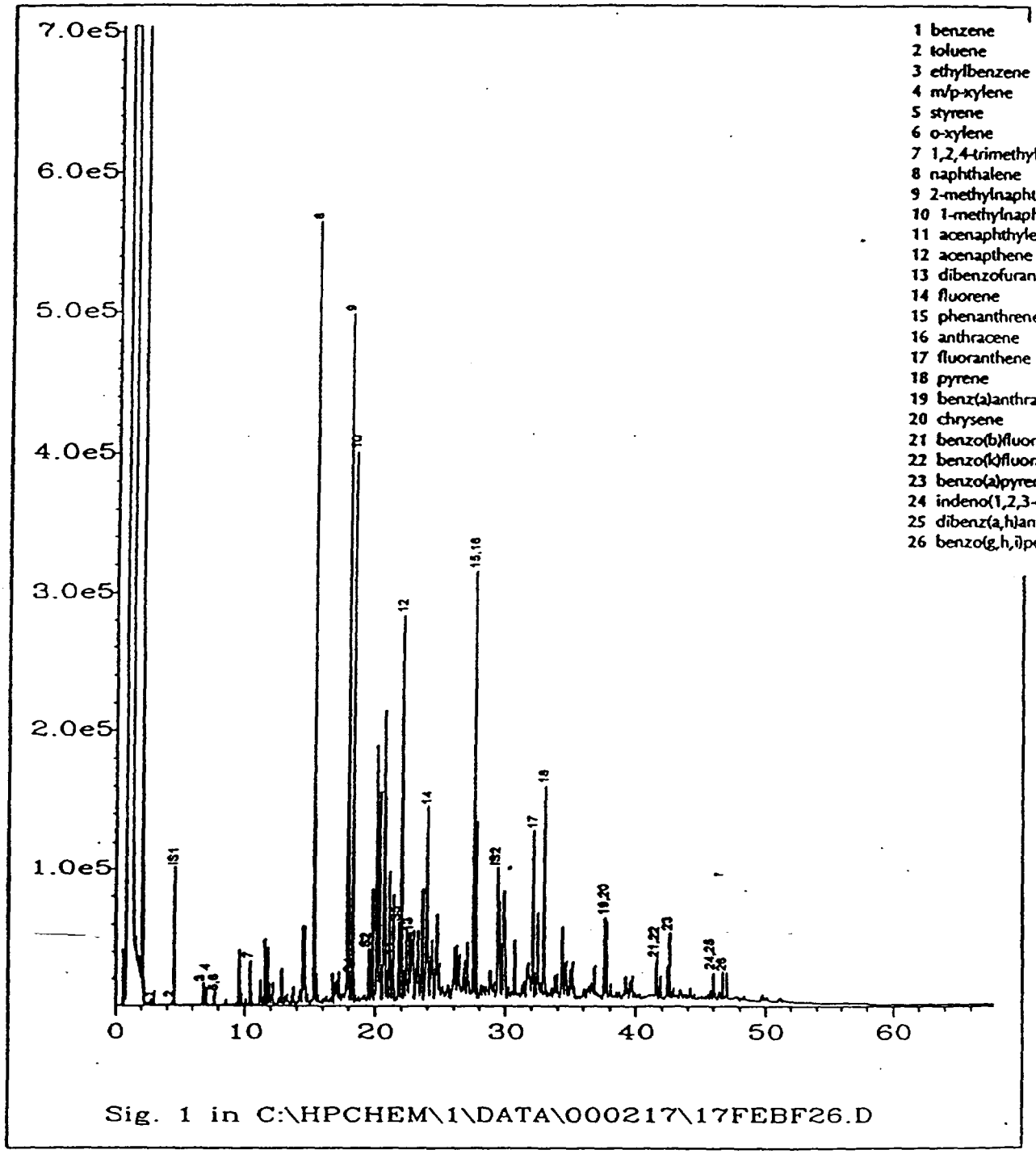


IS1 - 2,4-difluorotoluene
IS2 - o-terphenyl
S1 - fluorobenzene
S2 - 2-fluorobiphenyl
S3 - 5a-androstane
S4-2,5-dibromotoluene
S5-2-bromonaphthalene
S6-1-chlorooctadecane

Field ID:	AS-4
Laboratory ID:	IG000211-02PF
Method:	MET4007D

META

GC/FID Fingerprint

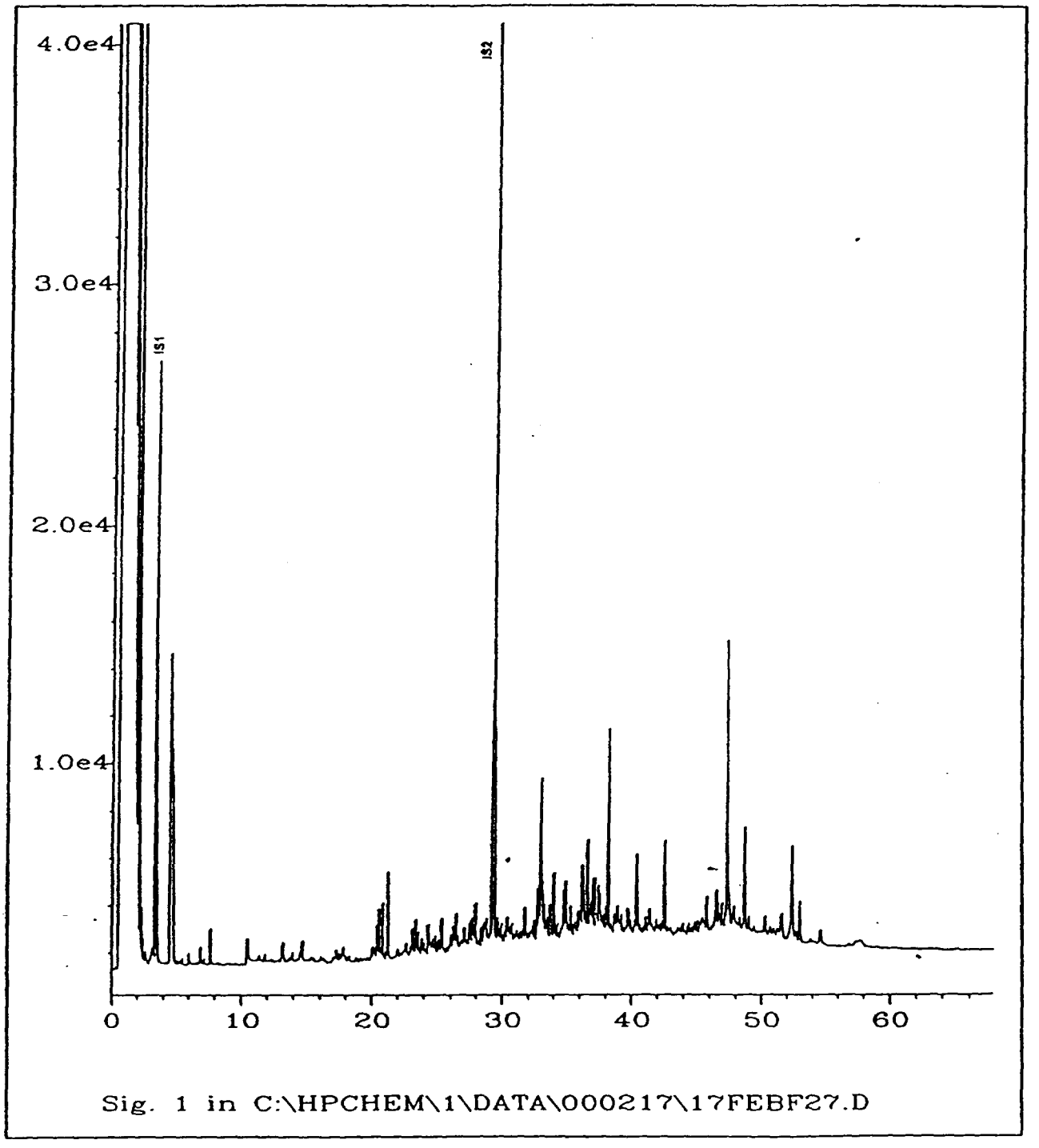


IS1 - 2,4-difluorotoluene
IS2 - o-terphenyl
S1 - fluorobenzene
S2 - 2-fluorobiphenyl
S3 - 5a-androstane
S4-2,5-dibromotoluene
S5-2-bromonaphthalene
S6-1-chlorooctadecane

Field ID:	AS-4
Laboratory ID:	IG000211-02DF
Method:	MET4007D

META

GC/FID Fingerprint



IS1 - 2,4-difluorotoluene
IS2 - o-terphenyl
S1 - fluorobenzene
S2 - 2-fluorobiphenyl
S3 - 5a-androstane
S4-2,5-dibromotoluene
S5-2-bromonaphthalene
S6-1-chlorooctadecane

Field ID:	AS-4
Laboratory ID:	IG000211-02MF
Method:	MET4007D

META

META ENVIRONMENTAL SAMPLE RECEIPT

Lab ID	Field ID	Matrix	Analyses	Date(s) Sampled	Date Received	Client/ Project	Container/ Preservative
IG000211-01	AS-2	Sediments	2608/3009/4007	02/08/00	02/11/00	105001-60	4oz. jar
IG000211-02	AS-4	Sediments	2608/3009/4007	02/08/00	02/11/00	105001-60	4oz.jar

02/11/00

CHAIN OF CUSTODY RECORD

PROJECT NAME NSP-ASHLAND
COMPANY DeMaria Hayes
ADDRESS 25 Icessel Court Suite 201
PHONE (608) 273-2886

SAMPLED BY Mark S. McCulloch Mark S. McCulloch
(Print Name) Signature
(Print Name) Signature
(Print Name) Signature

META Environmental, Inc.
49 Clarendon Street
Watertown, MA 02472
TEL: (617) 923-4662
FAX: (617) 923-4610

SAMPLE NO.	DATE	TIME	SAMPLE LOCATION	CONTAINER SIZE	CONTAINER G/P	GRAB	COMP	NO. OF CONTAINERS	SAMPLE MATRIX	PRESERVATIVE	ANALYSES	COMMENTS
	2/8	11:00	AS-2	40z	G	X		1	Soil	None	DM0002 11-01	Sent to Metz
	2/8	11:35	AS-3	"	G	X		1	Soil	"		Held by DSM
	2/8	12:10	AS-4 1 of 2	"	G	X		1	Soil	"		Held by DSM
	2/8	12:15	AS-4 2 of 2	"	G	X		1	Soil	"	DM0002 11-02	Sent to Metz
	2/8	10:35	AS-7	"	G	X		1	Soil	"		Held by DSM

temp. 0°C

Relinquished by	Date/Time	Received by	Relinquished by	Date/Time	Received by
Mark S. McCulloch	2/10 | 5:00PM	UPS			
Relinquished by	Date/Time	Received by	Relinquished by	Date/Time	Received for Laboratory by
				10:45am 02/01/00	Diane Bachman

Method of Shipment
UPS

Remarks:
Analyze per requirments of Diane Sabor at IET
AS-2 sample has the most amount of fluid
in A sample is backup

APPENDIX B

DAMES & MOORE
A DAMES & MOORE GROUP COMPANY

25 Kessel Court, Suite 201
Madison, Wisconsin 53711-62
608 273 2886 Tel
608 273 3415 Fax

May 25, 2000

Ms. Diane Saber
IGT
1700 S. Mount Prospect Road
Des Plaines, IL 60018-1804

RE: Dames & Moore Project No. 05644-092-133
Sediment Sample Collection
Ashland Lakefront/NSP Project, Ashland, Wisconsin

Dear Ms. Saber:

As you requested, this letter documents field procedures during the sediment sampling program for contaminated sediments for the Ashland Lakefront/NSP project in Ashland, Wisconsin. This task was performed near the Kreher Park shoreline on February 8, 2000. Samples were collected by SEH on behalf of the Wisconsin Department of Natural Resources (WDNR). For this confirmatory sampling, a Dames & Moore representative was on-site to observe sample collection procedures and to collect representative samples for finger printing analysis in accordance with the Dames & Moore January 25, 2000 Work Plan.

Prior to sample collection, SEH selected 7 locations (AS-1 through AS-7) for sample collection and surveyed each location relative to site datum. AS-1 is located in the Marina west of the Marina Pier and Kreher Park; AS-5 is located east of the public boat landing north of the public beach. AS-2, AS-3, AS-4, AS-6, and AS-7 are located between the Marina pier and the former wastewater treatment plant (see attached sketch).

At each sample location, a 6-inch diameter hole was drilled through the ice with an ice auger. The depth to bottom below the ice was measured, and a probe 48-inches in length was driven into the underlying sediment with a hand-held post driver. After the probe was extracted, the drive shoe was removed, and a plastic liner containing the recovered sample was removed from the probe. The recovered length of the core was then measured and the plastic liner was cut open and the contents inspected and sampled. The probe was cleaned with soap and water between sample locations and a new plastic liner was used for each sample collected.

A sample was not collected from the AS-5 location because the ice extended to the bottom and the sediment was frozen. The background sample of the sediment was collected from AS-1 where 1.4-feet of a dark brown sandy silty clay was recovered in the probe. Approximately 0.4-feet of black sediment overlying 1.3-feet of sandy, silty clay sediment was collected at the AS-7 location. A wood chip layer overlying the sandy silty clay sediment was encountered at the AS-2, AS-3, AS-4, and AS-6 sample locations. The wood chips and underlying sediment were stained and yielded strong petroleum like odors.

DAMES & MOORE
A DAMES & MOORE GROUP COMPANY

The wood chip layer ranged in thickness as follows: 0.3-feet at AS-6; 0.7-feet at AS-3; 1.8-feet at AS-2; and 1.9-feet at AS-4. SEH collected samples of sediment below the wood chip layer for laboratory analysis. Dames & Moore collected samples of the sediment and wood chip layer at the AS-2, AS-3, AS-4, AS-6, and AS-7 locations. Samples were properly logged and preserved as specified in the work plan. Samples from AS-2 and AS-4 were sent to Meta Laboratories for fingerprinting analysis. A copy of the completed chain-of-custody is attached.

Sincerely,

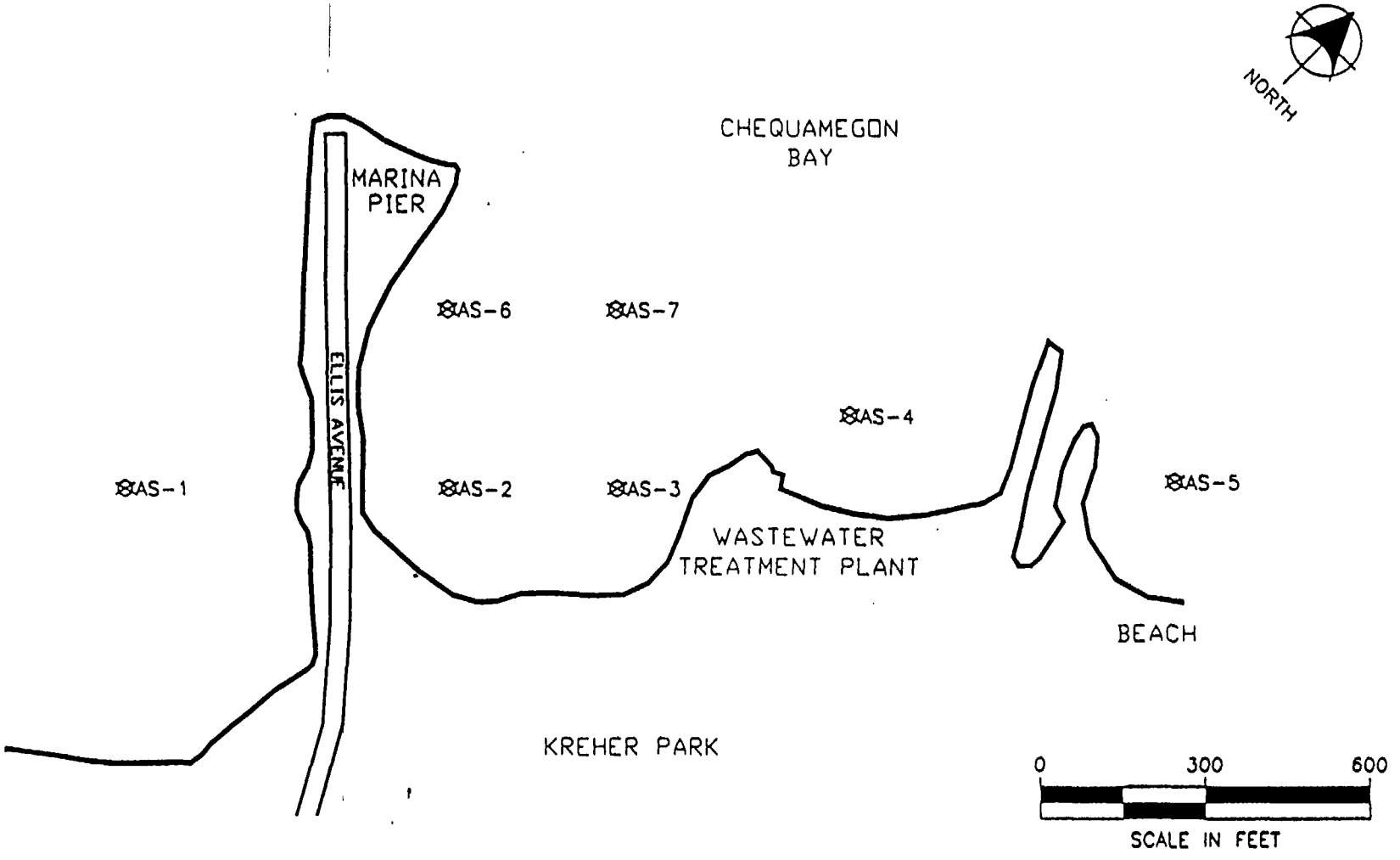
DAMES & MOORE

Mark S. McColloch, P.G.
Project Geologist

David P. Trainor
Principal

cc: Jim Musso, NSP
John Wilson, NSP
Dave Crass, Michael Best & Friedrich

I\dpt\nsp\sabr0525.ltr



NOTES:
1) APPROXIMATE LOCATION OF SEDIMENT SAMPLES.
2) SEDIMENT SAMPLES WERE COLLECTED ON FEBRUARY 8, 2000.

LEGEND
AS-1 SEDIMENT SAMPLE LOCATION

NORTHERN STATES POWER
ASHLAND, WISCONSIN

FIGURE 1
SEDIMENT SAMPLE LOCATIONS

DRN. BY KAM	DAMES & MOORE
PROJ. NO. 05644-095	A DAMES & MOORE GROUP COMPANY
DATE MAY2000	

I:\CADFILES\NSP\05644095\SEDIMENT.DWG

CHAIN OF CUSTODY RECORD

PROJECT NAME NSF ASHLAND
COMPANY Dames & Moore
ADDRESS 25 Kessel Court Ste 201
PHONE (608) 273-2886

META Environmental, Inc.
49 Clarendon Street
Watertown, MA 02472
TEL: (617) 923-4662
FAX: (617) 923-4610

SAMPLED BY Mark S McCulloch (Print Name) Mark S McCulloch (Signature)
(Print Name) (Signature)
(Print Name) (Signature)

SAMPLE NO.	DATE	TIME	SAMPLE LOCATION	CONTAINER SIZE	CONTAINER Q/P	GRAB	COMP	NO. OF CONTAINERS	SAMPLE MATRIX	PRESERVATIVE	ANALYSES	COMMENTS
	2/8	11:00	AS-2	1/2	G	X		1	Soil	None		Send to Meta
	2/8	11:35	AS-3	"	G	X		1	Soil	"		Held by DSM
	2/8	12:40	AS-4 1 of 2	"	G	X		1	Soil	"		Held by DSM
	2/8	12:55	AS-4 2 of 2	"	G	X		1	Soil	"		Send to Meta
	2/8	10:35	AS-7	"	G	X		1	Soil	"		Held by DSM

Relinquished by	Date/Time	Received by	Relinquished by	Date/Time	Received by
Mark S McCulloch	2/10 5:30PM	UPS			
Relinquished by	Date/Time	Received by	Relinquished by	Date/Time	Received for Laboratory by

Method of Shipment
UPS

Remarks:
Analyze per requirments of Diane Sabor at IGT
AS-2 sample has the most amount of fluid
AS-4 sample is backup

US EPA -- REGION 5
SUPERFUND DIVISION

Date: 2-6

DISTRIBUTION

RECIPIENTS	CIRCULATE		COPIES	
	FYI	Action	FYI	Action
~~Division Director~~	/			
Assoc. Div. Dir.				
Enforcement Coord.				
RRB #1				
RRB #2				
~~ERB~~	~~1~~			
In Battery	1			
PMB				
OCEPP				
Other				

Due: _____

COMMENTS

FYI - Bell